

INTRODUCTION TO THE CENTER FOR COMPOSITE MATERIALS

INTERNATIONALLY RECOGNIZED EXCELLENCE

Founded in 1974, the University of Delaware's Center for Composite Materials (CCM) has been internationally recognized as a center of excellence for interdisciplinary research, education, and technology transfer in the areas of materials and synthesis, multifunctional materials, processing science, mechanics and design, sensing and control, and software. CCM is dedicated to advancing composites technology through lower costs, higher quality, and reduced risk.

Background

CCM began working with materials suppliers and end users in the aerospace, automotive, civil engineering, and durable goods industries in the mid-1970s. Since then, the Center has collaborated with more than 3,500 small, medium, and large companies who have received benefits afforded with membership in the University-Industry Consortium.

Since 1986, UD-CCM's programs and initiatives have been designated Centers of Excellence eight times by the National Science Foundation (NSF), the Department of Defense (DoD) and the Federal Aviation



CCM educates engineers, conducts basic research, and provides prompt technology transfer for the composites community. Today, more than 50 faculty, 40 research professionals and post-docs and 100 graduate and undergraduate students are affiliated with UD-CCM.

Administration (FAA).

Research

During its 45 year history, CCM has developed core competencies in a number of composites science and engineering areas, including liquid molding, sensing and control, re-engineering, interphase science, composites from renewable sources, thermoplastic processing, joining, and cost modeling. Utilizing 58,000 square feet of state-of-the-art facilities and equipment valued at over \$25M, CCM develops models and simulations in a "virtual manufacturing" environment for process optimization and tool

design, leading to improved quality, affordability, and innovative new composite manufacturing processes. By controlling the microstructure and molecular architecture of existing and next generation materials, new composites are designed to accomplish multiple performance objectives in a single system. The Center also develops on-line sensors and devices for monitoring composites manufacturing to end-of-life and validates control schemes using simulations and manufacturing work cells. Our unique manufacturing science laboratory provides facilities for synthesis

45 YEARS OF INTERNATIONALLY RECOGNIZED EXCELLENCE

Technical Contact:

John W. Gillespie, Jr., Ph.D.
302.831.8702 | gillespi@udel.edu

101 Academy Street
Newark, DE 19716

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of new materials, chemical and mechanical characterization from nano-scale to large-scale structures, computation, design, and re-engineering and manufacturing work cells on existing and next-generation processes that are ready for transition to our sponsors.

Technology Transfer

Center researchers view industry and government as partners rather than patrons. Technology transfer thus becomes a logical outgrowth of the research rather than a separate activity. CCM's current research programs are being carried out with the support of and in collaboration with industry, federal agencies, such as AFOSR, ARL, ARO, DARPA, DOE, DOT, NASA, NSF, ONR, TARDEC, and others, as well as the State of Delaware. Examples of recent technology transfer include an automated thermoplastic lamination process using induction heating by the largest U.S. user of carbon prepreg, design and prototype development for various vehicle components, and implementation of our SMARTMolding automated infusion station in 12 production sites.

21ST CENTURY DESIGN & MANUFACTURING

Basic Research to Product Development

<u>Design & Analysis Software Platforms</u>			<u>Materials Development & Characterization</u>		
 Manufacturing Simulations	 CAD-CAM	 Impact Crash	 Nano-Science Research	 Interface Evaluation	 Chemical Characterization
<u>Mechanical Testing Capabilities</u>			<u>Process Development</u>		
 Impact	 Coupon Characterization	 Infrastructure	 Liquid Composite Molding, VARTM	 Autoclave	 Automated Material Placement (AMP)

Education

Students and faculty in the Center are affiliated with the University of Delaware departments of Chemical & Biomolecular Engineering, Civil & Environmental Engineering, Electrical & Computer Engineering, Materials Science & Engineering, Mechanical Engineering, Physics & Astronomy, and Chemistry & Biochemistry; and the College of Business & Economics.

CCM students at all levels are active participants on interdisciplinary research teams. In addition to a solid grounding in the fundamentals, composites students at UD gain practical insight into the solution of real-world engineering problems. They also have the opportunity to interact with visiting students, faculty, and researchers from industry, government agencies, and other universities in the U.S. and abroad.

Related continuing education opportunities include Engineering Outreach and CCM workshops, symposia, and seminar series.



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